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# Energy Futures Research

**Paul Graham**

**Scientists in Schools Symposium 2007**

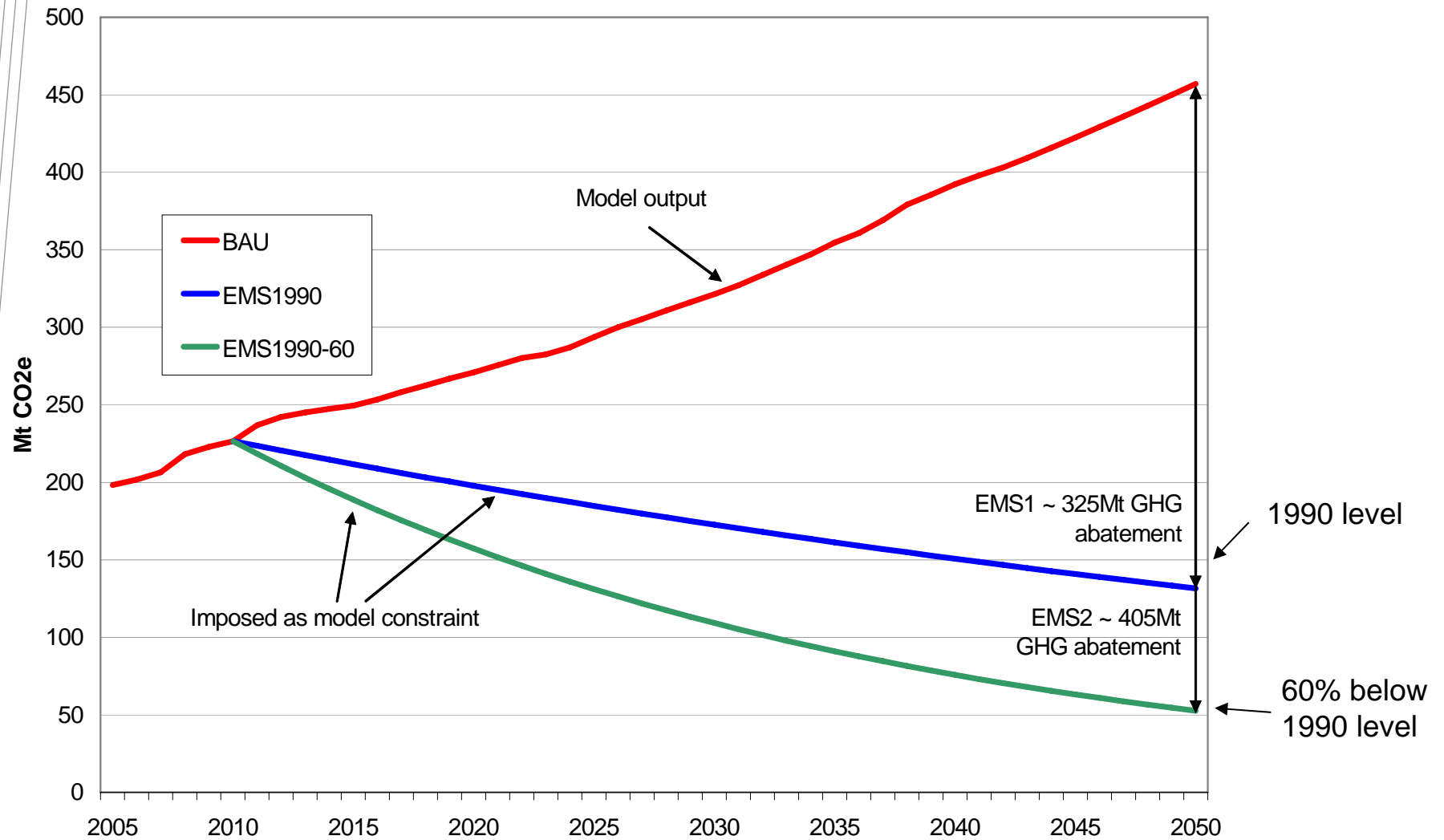
National Research  
**FLAGSHIPS**



# Addressing climate change

- 2°C warming is often discussed as a temperature target
- The probability that 550 ppm eCO<sub>2</sub> would avoid more than 2°C warming is only about 5%.
- A concentration target of 450ppm eCO<sub>2</sub> would avoid the risk of more than 2°C degree warming with a probability of 40%.
- Global emission changes consistent with achieving 550ppm and 450ppm by 2050 are around 1990 levels (+10% to -10%) and -15 % to -40% below 1990 levels respectively.
- Differentiated emission targets by 2050 that might be consistent with these global concentration targets are as follows:
  - 450ppm: Developed countries emissions 80% below 1990, developing country emissions 50% above 1990.
  - 550ppm: Developed country emissions 60% below 1990, developing country emissions 110% above 1990.

# Base case emission targets



# Three cases explored

## Base case

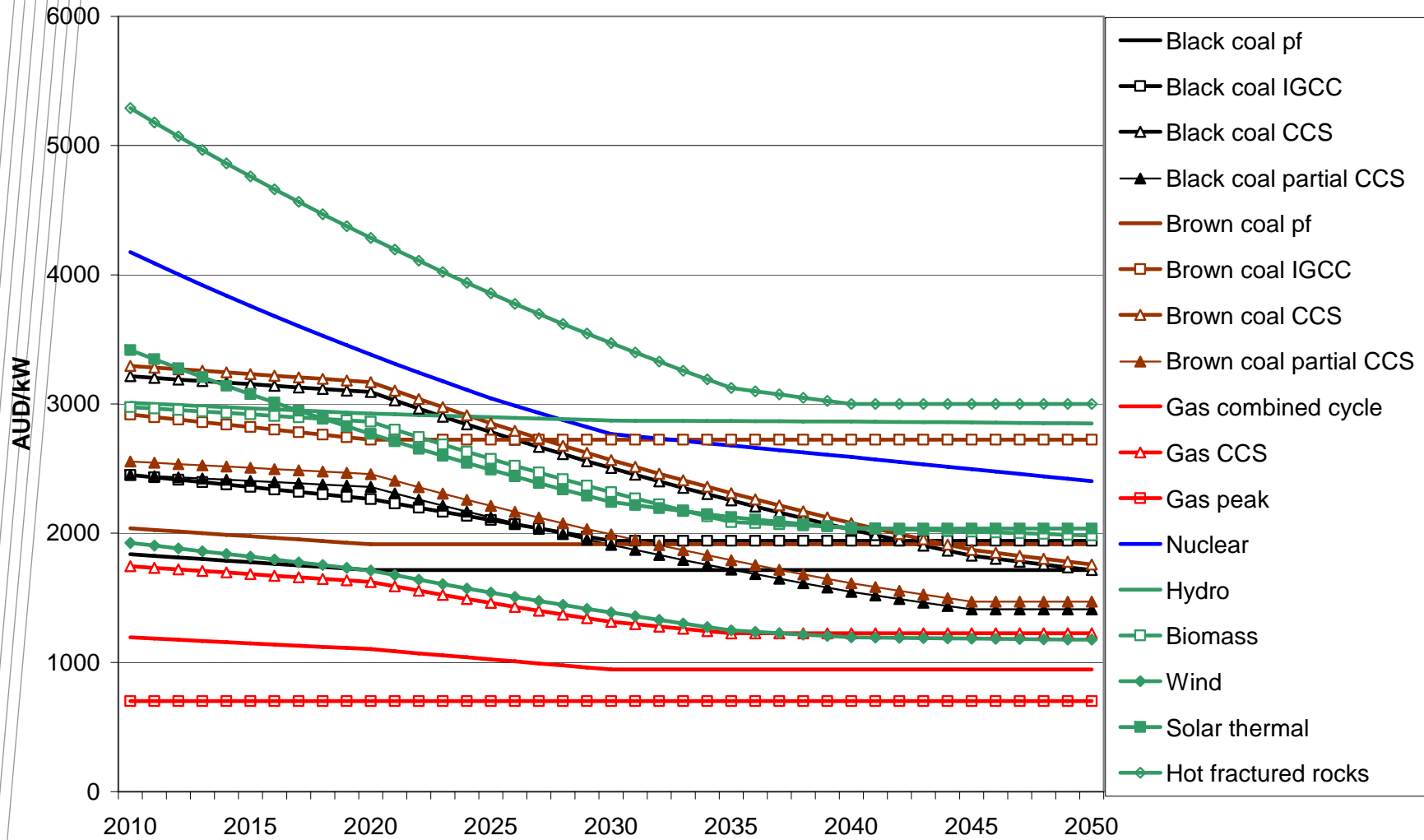
- All technology options available

## CO<sub>2</sub> capture and storage infeasible

## Gradual emission path

- A slower start to reaching the emission reduction target in 2050

# Base case technology cost projections

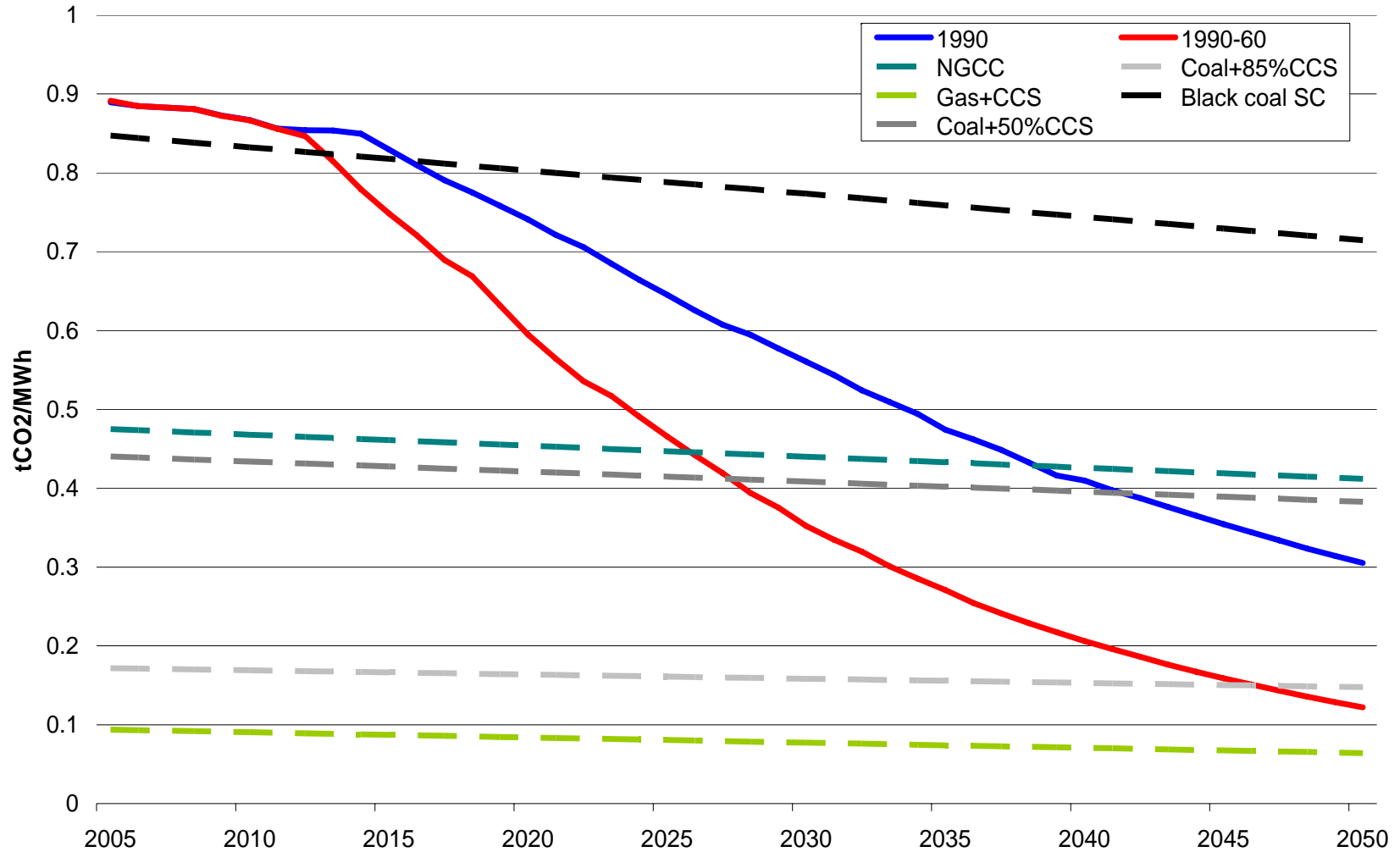


# Base case renewables policy assumptions

- We only assume minimum renewable electricity generation amounts in NSW and Victoria of 10 and 15% respectively. More states will follow suit
- Recently announced national 30,000GWh Clean Energy Target is equivalent to 11% base case generation in 2020
- 2020 renewables share in the modelling is as follows:

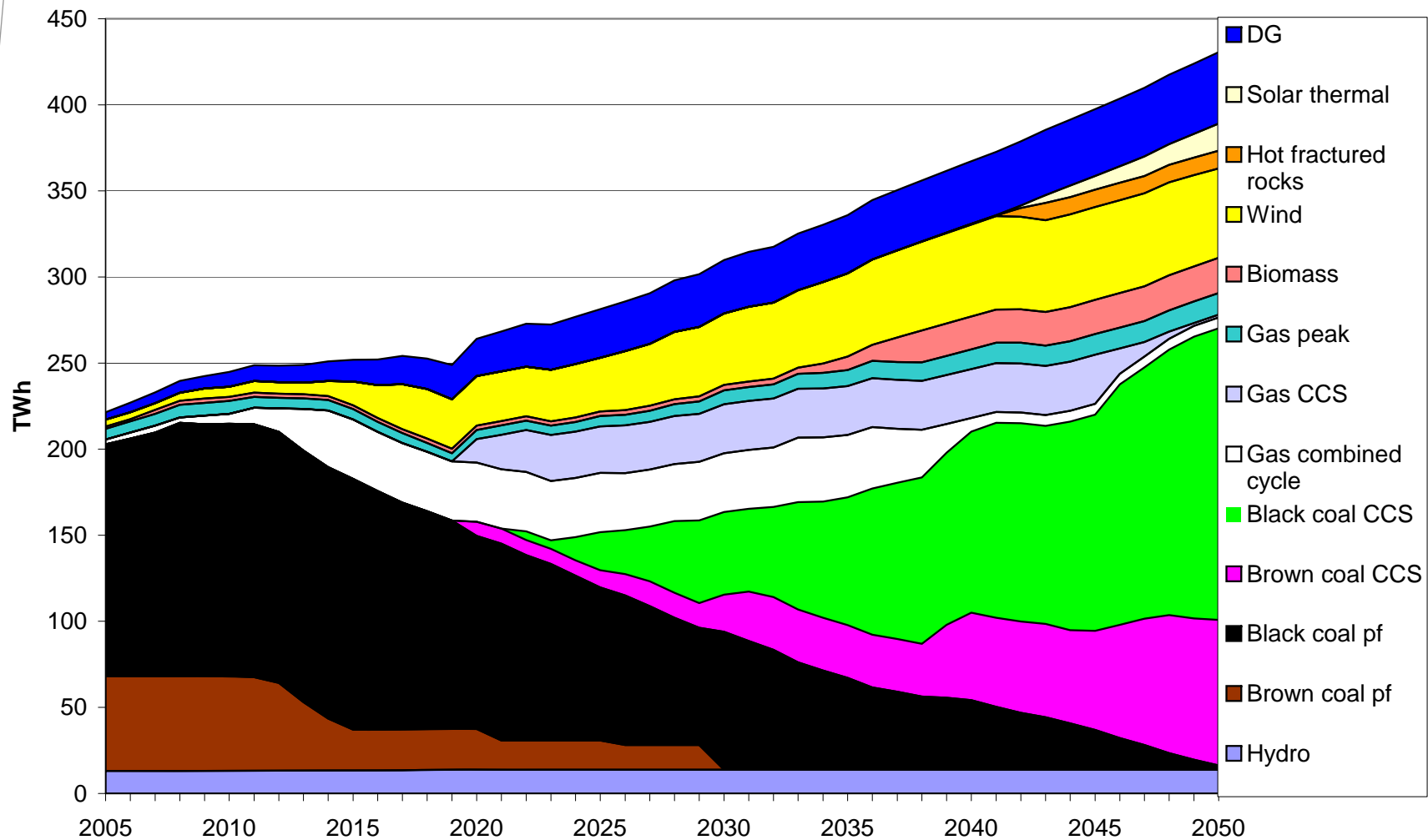
		Hydro	Non-hydro	All renewables
Base	1990	5.0	3.7	8.7
	1990-60	5.2	11.9	17.1
Gradual emis. path	1990	5.0	3.5	8.6
	1990-60	5.0	3.7	8.7
CCS infeasible	1990	5.0	3.7	8.7
	1990-60	5.3	12.9	18.2

# Emission intensity of targets vs. technologies

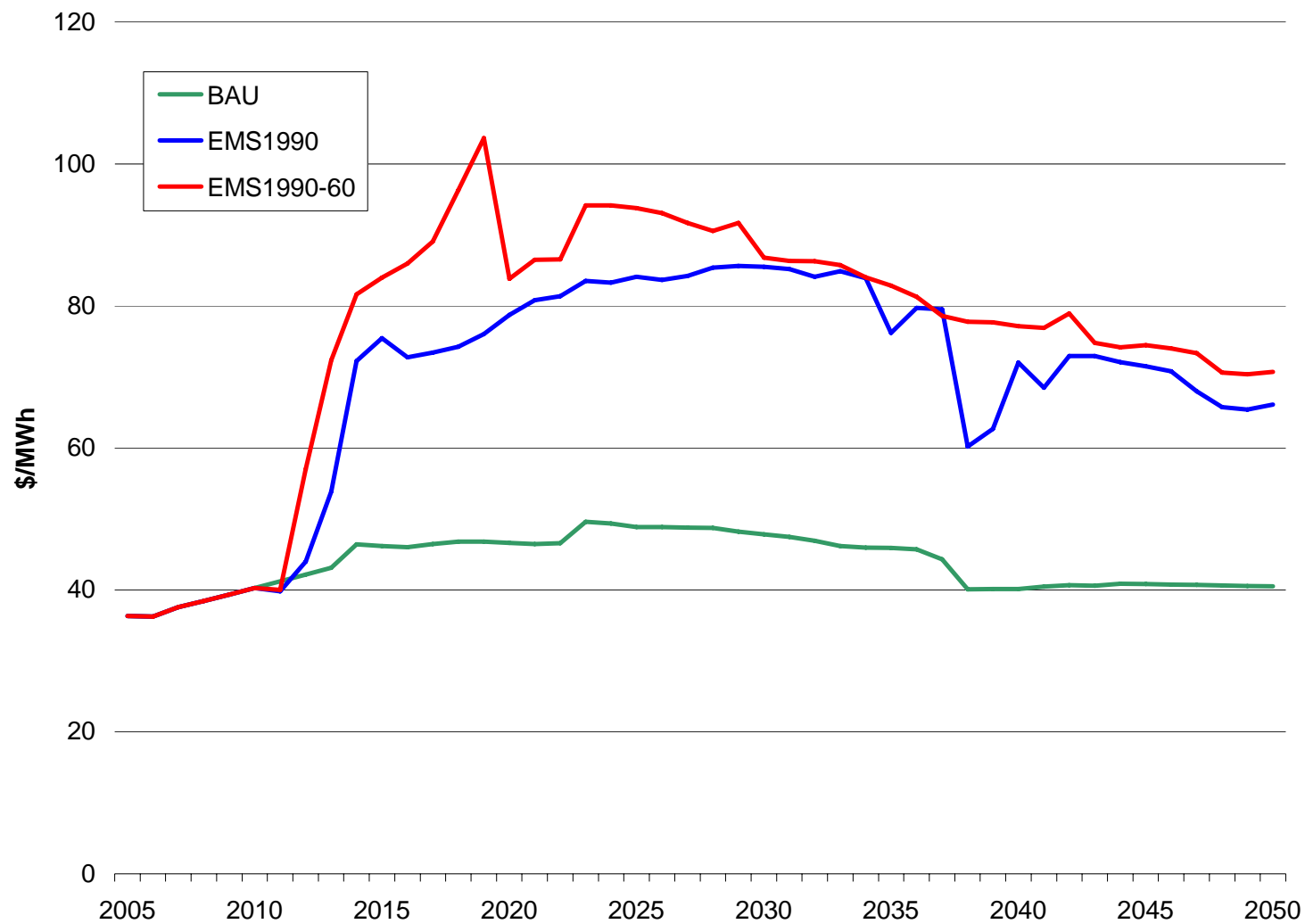




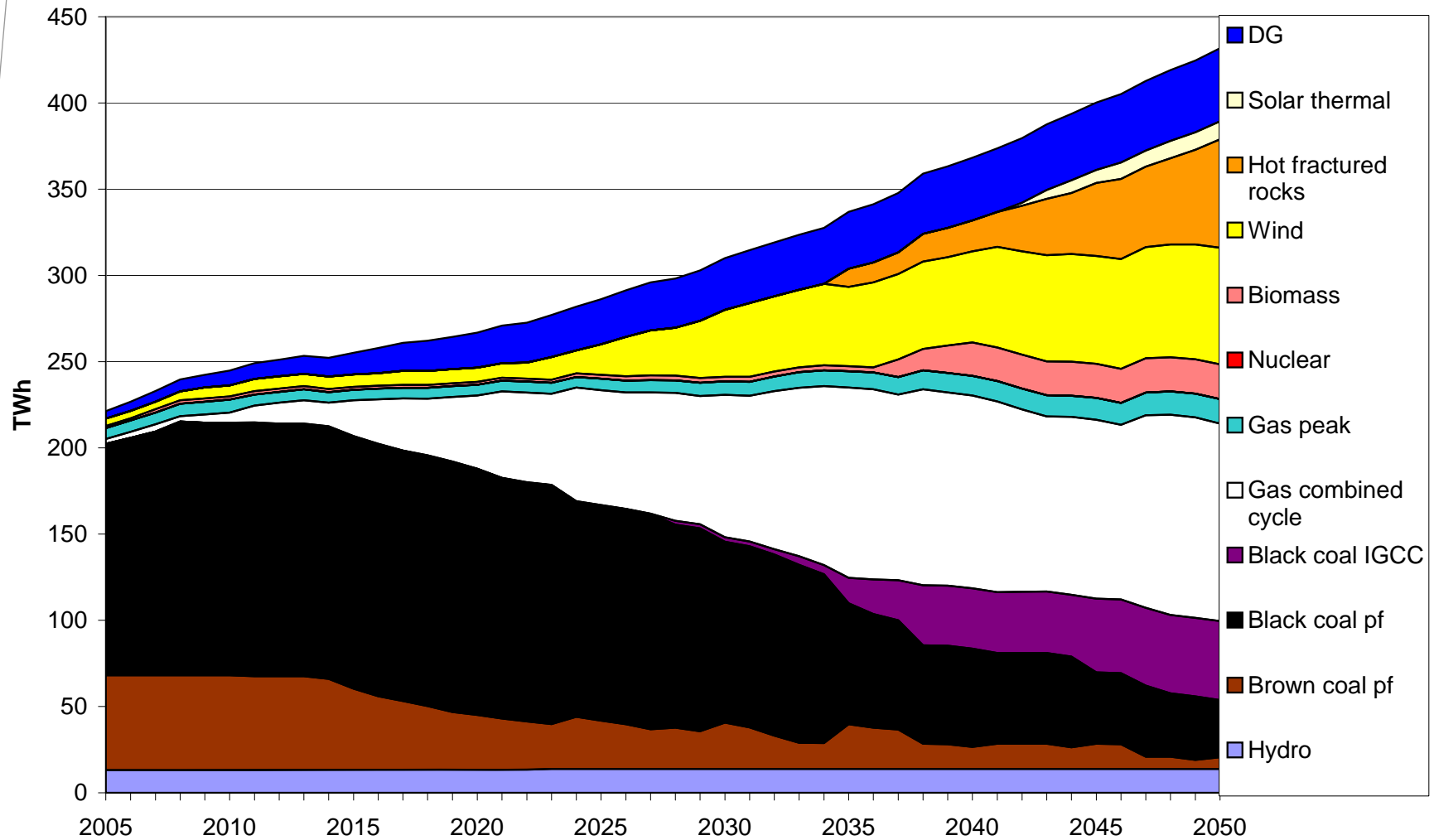
# Base case - 60% below 1990 emissions by 2050



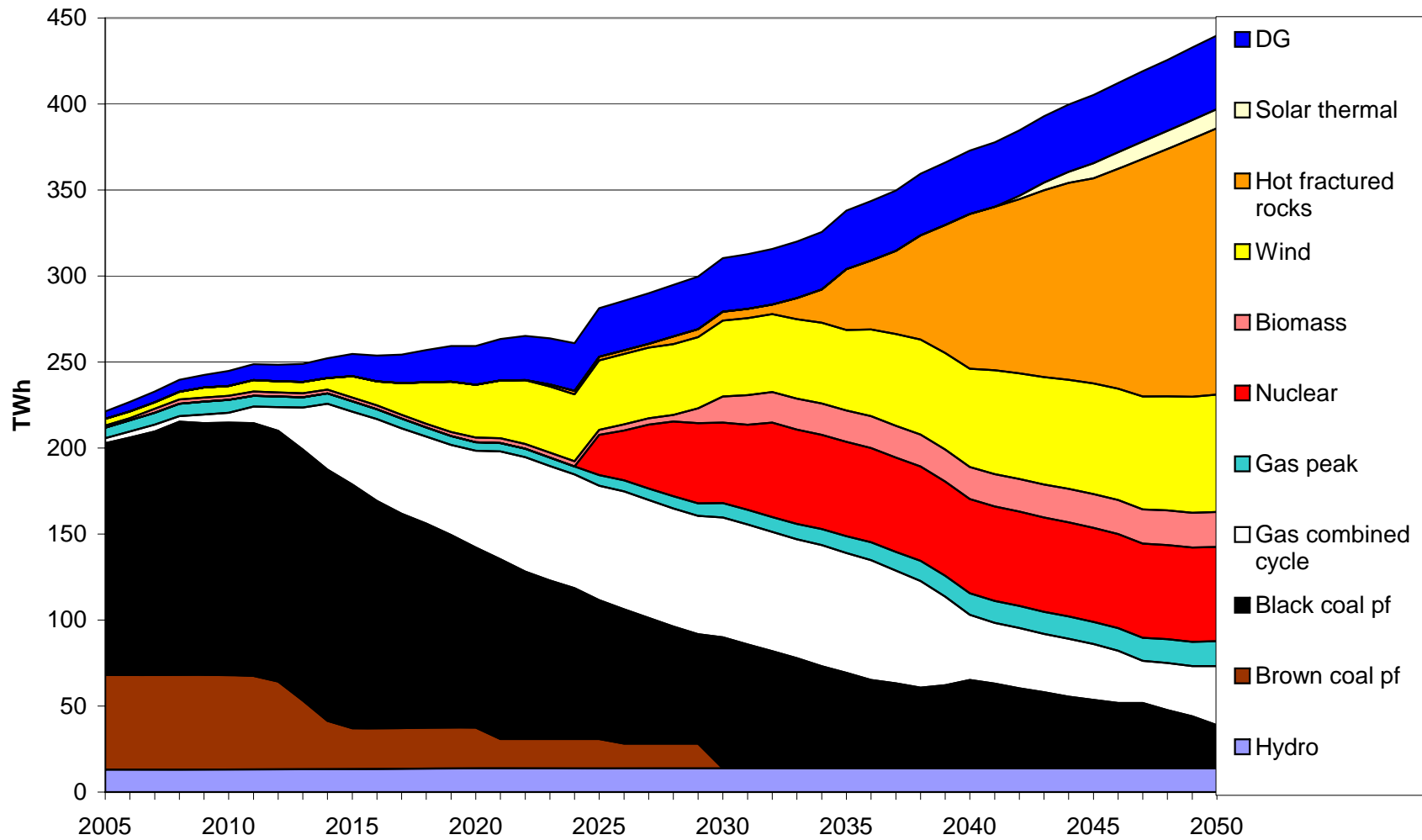
# Wholesale electricity prices



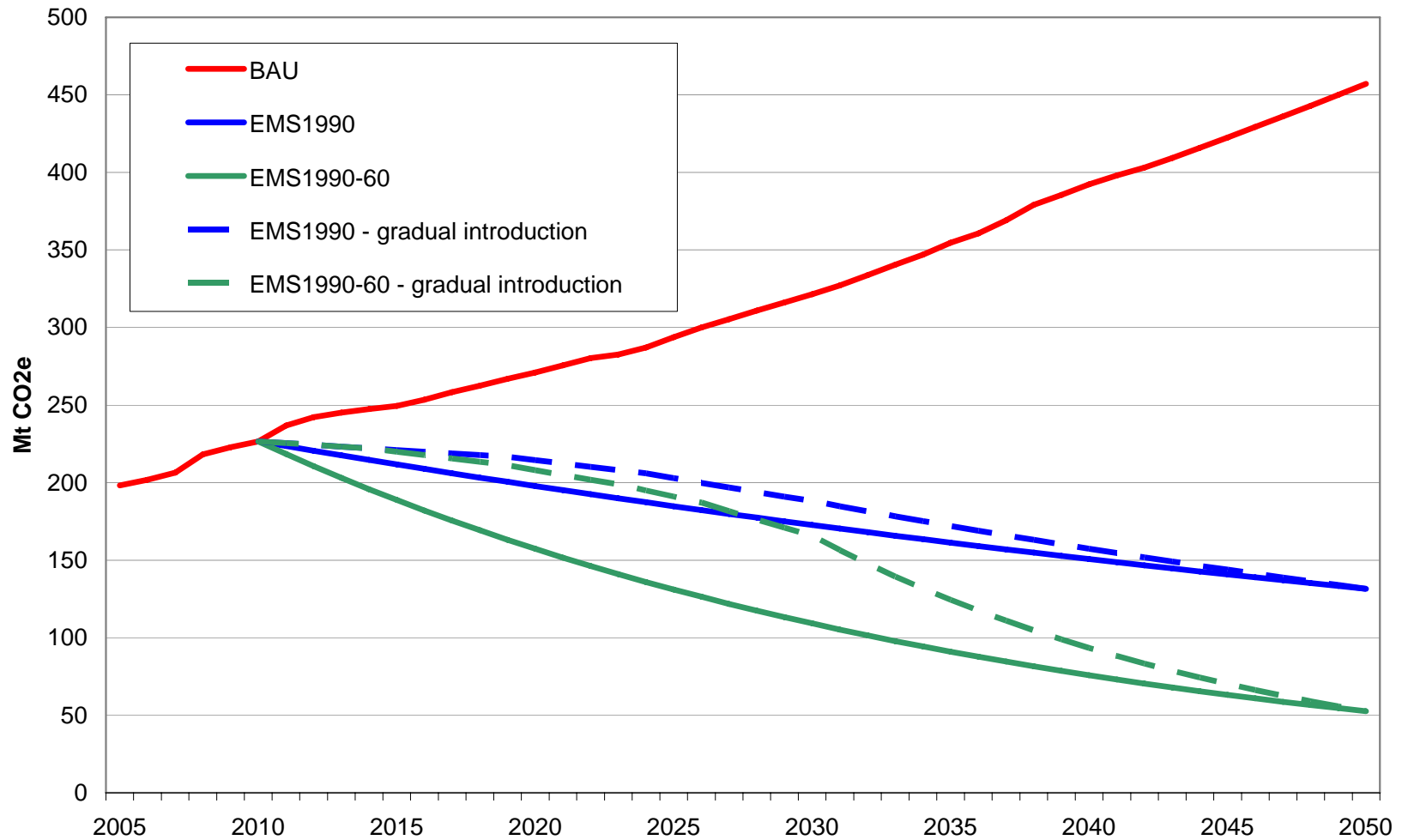
# CCS infeasible case – 1990 emissions by 2050



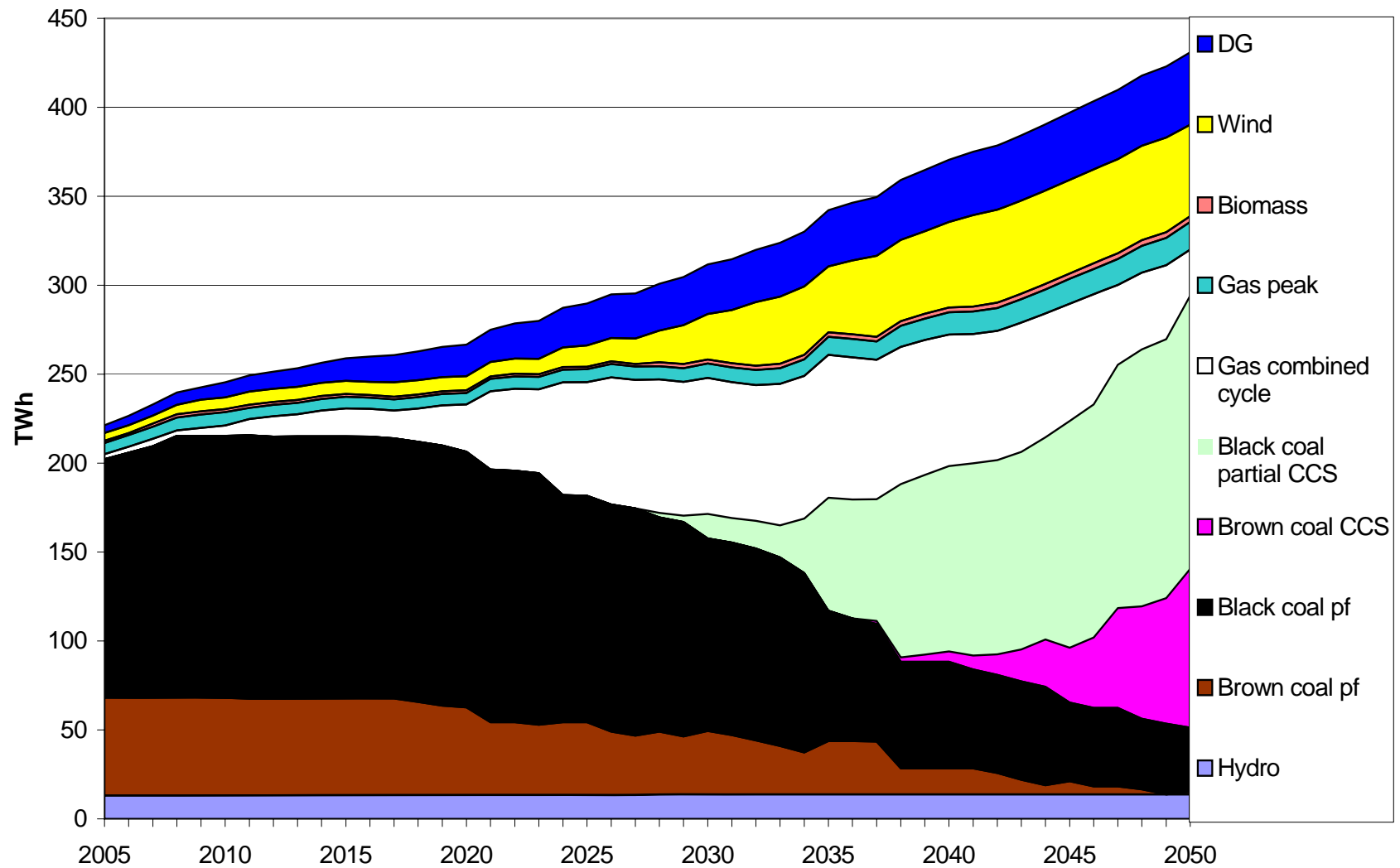
# CCS infeasible case – 60% below 1990 emissions by 2050



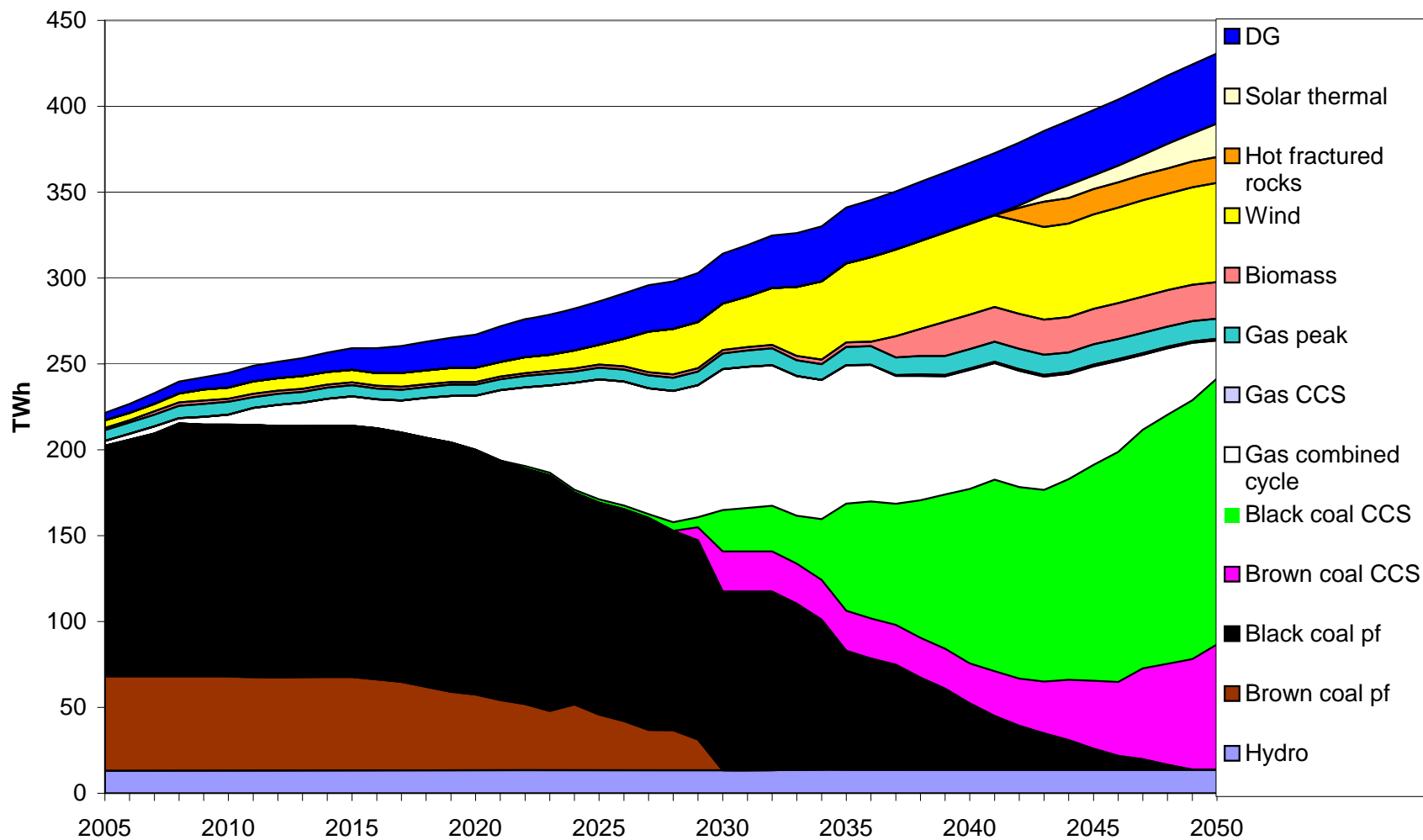
# Gradual emission path case



# Gradual emission path case – 1990 emissions by 2050



# Gradual emission path case – 60% below 1990 emissions by 2050



# Key findings

- Gas prices, the emission reduction target and path and the successful demonstration of new technologies are key uncertainties in understanding the electricity sector's response to climate change
- Nuclear and natural gas with carbon capture become competitive only if the rate of emission reduction is high prior to 2030. There may be no competitive window if targets are phased in more gradually.
- New black coal plant which captures 50% of its CO<sub>2</sub> emissions is viable for an emission target at 1990 levels by 2050, but only full capture is viable for deeper cuts.
- If CO<sub>2</sub> capture and sequestration is not feasible the next most competitive alternatives are initially nuclear then renewables, in particular hot fractured rocks. Nuclear power only appears in the scenario where CCS is not viable.